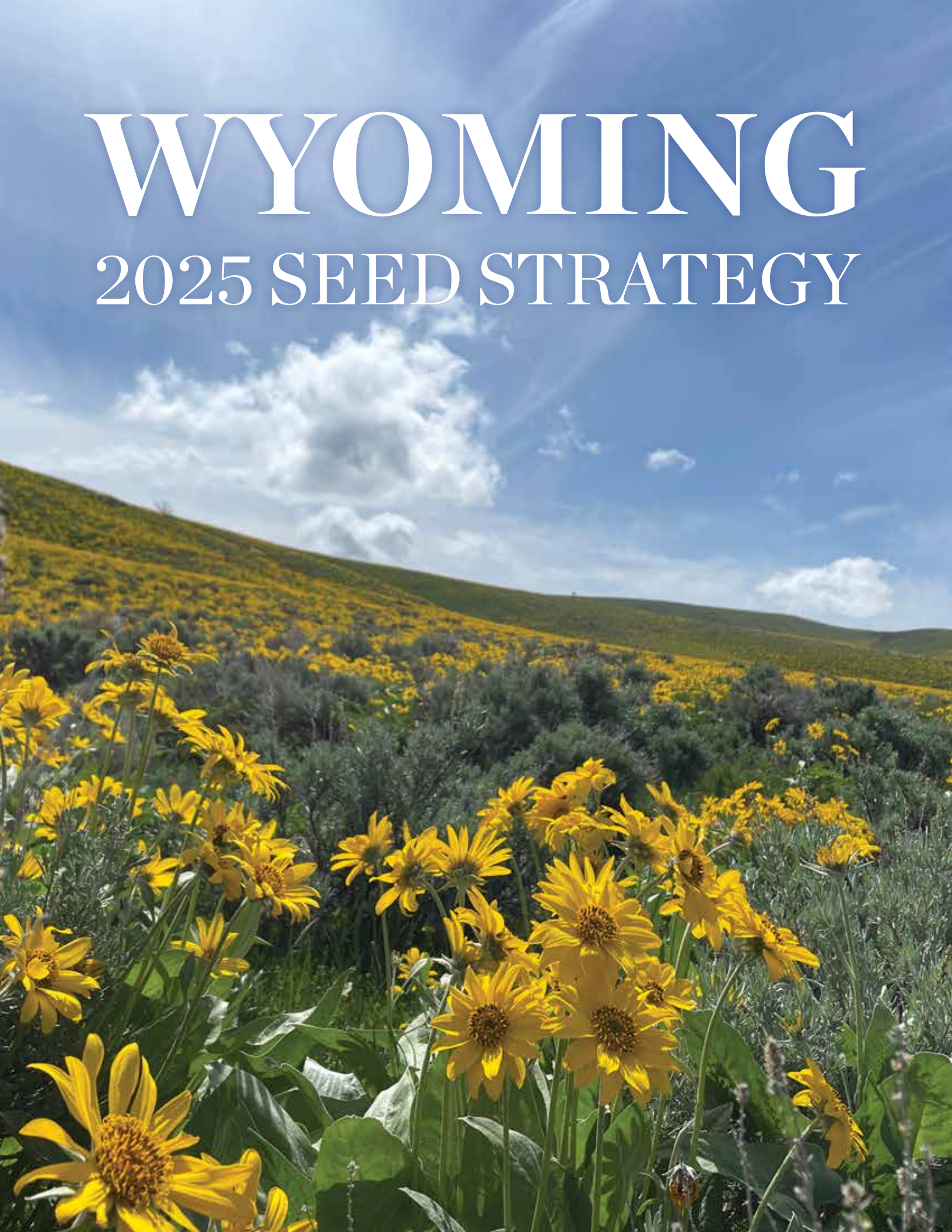
WYOMING

2025 SEED STRATEGY



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ECOREGION MAP

Introduction

Intact native plant communities safeguard the resilience and essential functions of native ecosystems: providing habitat, supplying forage for livestock, storing soil carbon as part of natural climate solutions, and reducing the risk of extreme wildfires. Wyoming contains the largest intact extent of sagebrush steppe and is home to nearly 40% of the remaining sage grouse (Doherty et al., 2022). While much of Wyoming's sagebrush ecosystem is in good condition, the spread of invasive annual grasses, exacerbated by warmer, drier conditions, presents a clear threat to the integrity of this landscape. In this critical moment, Wyoming can be proactive about enhancing the native seed market and enabling improved restoration, reclamation, and rehabilitation outcomes before the anticipated acceleration of the invasive grass-fire cycle.

Successful restoration, reclamation, or rehabilitation of disturbed, burned, and annual-invaded land is critical to maintaining ecosystem function and reducing the risk of future annual grass invasion and wildfire. Native plant seeds are critical to these efforts, but sourcing native seeds can be challenging. Land managers and contractors in Wyoming often report that native seeds' availability is a limiting factor to successful restoration, reclamation, and rehabilitation. In 2022, The Nature Conservancy conducted a survey of seed users in the state to better understand the barriers to seed availability and use. Across many sectors, participants stated that the lack of availability and high cost of native seeds were the top two barriers to including locally adapted native species in seed mixes for restoration or reclamation projects in Wyoming. These barriers can lead practitioners to use non-native species or seed sources that are not suitable for site conditions, which in turn can result in maladaptation and establishment failure, or at best significantly limit the ability of these sites to recover their original biodiversity and function.

In 2015, the National Seed Strategy laid out a framework for building a seed industry that could supply restoration, reclamation, and rehabilitation projects with the plant material needed to successfully build diverse plant communities (Plant Conservation Alliance, 2015). The number one goal of the National Seed Strategy is to "Identify seed needs and ensure the reliable availability of genetically suitable seed," highlighting the paramount importance of native seeds in restoration, reclamation, and rehabilitation. Continued implementation success of the National Seed Strategy depends on active engagement and effective coordination of stakeholders along the native seed supply chain at the local, regional, and national levels to enable practitioners to put the right seed in the right place at the right time (PCA, 2015; Pedrini & Dixon, 2020).

The purpose of the Wyoming Seed Strategy is to expand where the National Seed Strategy is implemented and to tailor it to regional dynamics. For example, the relatively intact nature of Wyoming's sagebrush ecosystem means that the solutions in progress in other areas, such as the Great Basin, where strategies reflect a more degraded ecosystem with wildfire-driven restoration needs, may diverge from strategies that are most suitable for Wyoming. The Wyoming Seed Strategy thus focuses on identifying the barriers in the native seed supply chain and working to address them through collaboration among partners throughout the state. This Strategy will serve as a locally focused complement to and "step down" from the National Seed Strategy.

Mission

The Wyoming Seed Working Group will work to maintain and expand the high-quality seed grown in Wyoming, provide the state with the right seed and education for its reclamation success and support the state's seed industry.

Vision

A seed market that provides high-quality, diverse seed in sufficient quantities with adequate processing and storage capacity to meet the needs of land managers and restoration and reclamation practitioners while providing economic stability to producers.

Guiding Values and Principles

- We value Wyoming's native plants, which are key to ecosystem resilience and provide a way of life for our people, communities, wildlife and economies.
- Native plant communities have intrinsic and irreplaceable biotic value that will become increasingly important in the future.
- The native seed bank in the soil should be used as much as possible, considering that not all disturbances require active seeding to restore habitat. The need for supplemental seeding should be evaluated on a case-by-case basis.
- Having the right seed in the right place at the right time is vital for restoration, reclamation and rehabilitation.
- Wildland seed collections alone will not meet current and future demand without degradation to native plant communities. Cultivation of seeds will be required to meet restoration, reclamation and rehabilitation needs.
- Strategic use of non-native species and non-local varieties can have a role in achieving site stabilization, wildfire breaks, or invasive plant control to maintain functioning resource values while following existing land management policies and guidelines.
- Native plants contain unique properties, and the full benefit of these may not yet be recognized but should be preserved for future generations.
- Botanical, agronomic, ecological, and genetic scientific expertise is critical to supporting and guiding restoration, reclamation and rehabilitation.
- A thriving native seed market is needed to support the revegetation guidelines set forth by agencies and to avoid revegetation failures.
- Building a viable native seed market will increase economic activity in Wyoming, while also increasing the diversity and quantity of genetically suitable seeds for restoration, reclamation and rehabilitation.
- Partnering with a diverse group of stakeholders, including state and federal agencies, Tribal nations, industry, producers, universities, and nonprofits, enhances the quality and effectiveness of this Strategy.
- Participants support opportunities to:
  - Maintain or increase the number of acres of native plant communities that provide ecosystem services;
  - Include federal, Tribal, state and local governments; academic institutions; nonprofits; and the private sector when addressing restoration, reclamation and rehabilitation issues;
  - Improve the availability of locally adapted and genetically suitable seed required to restore healthy native plant communities;
  - Develop strategies and tools for conducting more effective restoration, reclamation and rehabilitation;
  - Promote research, science delivery and education required to meet new challenges imposed by increasing threats; and
  - Communicate the value of native plant communities and restoration to stakeholders and the general public.

Goals of the Wyoming Seed Strategy

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Increase demand for genetically suitable seeds

GOAL 2:
Improve the supply of genetically suitable seeds

GOAL 3:
Improve the use of genetically suitable seeds

GOAL 4:
Pursue funding and external communication opportunities

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	1.2.3 Research whether any priority species would benefit from more "local" seed sourcing.
	1.2.4 Develop genetic management plan for producers and land managers.

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	4.2.2 Create video highlighting the Wyoming Seed Strategy and work being done under it

GOAL 1: Increase demand for genetically suitable seeds.

To meet the restoration, reclamation and rehabilitation needs of Wyoming in a way that preserves ecosystem function and high-quality habitat requires the use of genetically suitable seeds. A reliable supply is currently lacking in Wyoming. To address this, we will work collaboratively across agencies and organizations in the state to assess the demand for native seeds by examining state and federal regulations governing revegetation. This includes creating a priority list of species, forecasting current and future seed needs, and summarizing agency regulations (Objective 1.1). We aim to characterize the genetic variation of priority species by researching the potential benefits of local seed sourcing and developing a genetic management plan for producers and land managers (Objective 1.2).

Objective 1.1: Work collaboratively to plan seed needs in Wyoming.

To achieve this objective, we will need to understand how each state and federal agency regulates revegetation and the use of native seeds to begin assessing current and future demand. We will also create a list of priority species to concentrate demand to ensure a more reliable and stable seed market. This will benefit producers and help to ensure that the most in-demand seeds are available for restoration, reclamation and rehabilitation projects.

Action 1.1.1: Summarize agency regulations for seeding and how that intersects with demand.

This summary will serve as a quick guide to federal and state regulations regarding reseeding that can be used by practitioners. This will also help assess demand for native seed by determining which land management agencies require the use of native seed during restoration, reclamation and rehabilitation projects.

Action 1.1.2: Create a priority list of species for the state, including both commercially available and unavailable species.

This priority list will inform producers about species demand and provide species on which to focus research efforts. To create the priority list, we will consult Federal and State agency priority determine what species are most

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purchased in Wyoming and whether they are available from corresponding ecoregions or seed zones, and determine what species are most requested/desired but not available.

Action 1.1.3: Forecast current and future seed needs.
In partnership with agencies and reclamation practitioners, we will calculate current seed use in Wyoming. To estimate future seed needs, we will combine current seed use trends with development and disturbance models to forecast seed needs at a species level that can inform and assist producers.

Objective 1.2 Research population selection, suitability and improvement.

This objective focuses on using science-based processes to identify and/or develop native plant materials that are best suited for adaptation to restoration, reclamation and rehabilitation sites in Wyoming. All research under this objective will be prioritized and coordinated by the Research Committee.

Action 1.2.1: Evaluate collections of priority native shrubs, grasses and forbs for their restoration, reclamation and rehabilitation utility.
Test different seed lots for characteristics that would indicate adaptability to restoration, reclamation and rehabilitation sites in multiple locations within the intended area of use. If a particular collection does well, describe the conditions in which it is most likely to successfully establish in and how broadly it is adapted. Maintain seed of this plant material.

Action 1.2.2: Improve performance of collections of priority native shrubs, grasses and forbs, when necessary.
For sites where no suitable ecotypes are identified, further research and development of improved native plant materials focused on these hard-to-reclaim areas may be necessary.

Action 1.2.3: Research whether any priority species would benefit from more "local" seed sourcing.
Use common garden or reciprocal transplant experiments to evaluate effectiveness of using local seed sources on restoration outcomes.

Action 1.2.4: Develop genetic management plan for producers and land managers.
Develop a plan that outlines the best practices for maintaining genetic diversity throughout seed collection, production and use. This plan will also summarize limits on acceptable number of generations in cultivation from seed certification program and agency regulations.



GOAL 2: Improve the supply of genetically suitable seeds.

Wyoming does not have a reliable supply of genetically suitable seeds, despite interest from seed users and guidelines from governmental agencies. To achieve this goal, we aim to work collaboratively across agencies and organizations within Wyoming to improve the availability of genetically suitable seeds through enhancing seed collection capacity, coordination, and seed availability across agencies and organizations (Objective 2.1), improve the procurement of seed and pursue opportunities for cross-agency collaboration (Objective 2.2), assess state-wide seed cleaning and storage capacity and future needs as well as develop seed storage and cleaning protocols (Objective 2.3), identify knowledge and capacity gaps in seed production (Objective 2.4) and develop and disseminate information to support producers (Objective 2.5).

Objective 2.1: Work collaboratively to increase capacity for sustainable seed collection.

This objective expands and coordinates sustainable seed collection efforts for priority species to increase the amount and diversity of wild-collected seed available for commercial seed production while also protecting wild populations from overharvesting.

Action 2.1.1: Expand sustainable seed collection efforts.
Establish goals for sustainable seed collection of priority species for use in research, seed production and restoration, reclamation and rehabilitation projects.

Action 2.1.2: Assess feasibility and need for interagency collections.
Using the seed needs forecast in Action 1.1.3 and the seed collection goals in Action 2.1.1, determine whether interagency seed collections are possible and whether they would aid in expanding seed collection efforts.

Action 2.1.3: Assess the feasibility of developing a tool to track seed collections to avoid overharvesting of populations.
Assess whether using ArcGIS or a similar tool to create a map that documents seed collection efforts across agencies would be useful in avoiding repeated collections at the same sites.

Action 2.1.4: Assess options for making sustainable seed collection permitting easier across agencies.
Create factsheets that outline the sustainable seed collection permitting process for each state and federal agency. Determine if there are ways that permitting could span agency boundaries.

Action 2.1.5: Develop fact sheets of best practices for sustainable seed collection of priority species.
Create fact sheets that include information about seed ripening, seed collection methods, seed production, seeds per pound, seed pathogens or predators, and other tips for collection.

Objective 2.2: Improve state-wide seed procurement and cross-agency availability of native seed.

To achieve this objective, we will evaluate existing models for cross-agency seed purchasing and funding to determine if they could be adapted for Wyoming.

Action 2.2.1: Determine the need for a state-based seed program and assess barriers to interagency cooperation and coordination.
Conduct a gap analysis by talking to agencies, seed users and other stakeholders to understand opportunities for and barriers to collaboration to meet seed needs statewide.

Action 2.2.2: Research seed purchasing models used by other states.
Understand seed production funding and seed purchasing models used in other states (e.g., Utah Division of Wildlife Resources Great Basin Research Center, Nevada Foundation Seed Program) and determine whether any of those models are feasible or advantageous to use in Wyoming.

Objective 2.3: Assess seed cleaning and storage capacity.
This objective assesses what seed cleaning and storage capacity is currently available in Wyoming and across the region. It also answers whether this meets the current and future needs of seed producers and users in the state.

Action 2.3.1: Evaluate the existing seed cleaning and storage facilities available to Wyoming stakeholders and determine whether they present a bottleneck to seed supply in Wyoming.
Develop a list of all seed cleaning and storage facilities used by producers and seed collectors in Wyoming, along with the available capacity of those facilities. Compare with the seed needs forecast from Action 1.1.3 to determine what additional capacity is required.

Action 2.3.2: Assess feasibility and need for a shared producer and reclamation seed warehouse.
Based on interviews with seed producers and users and the seed needs forecasting, determine whether additional warehouse space is required. Determine whether any additional warehouse space is needed to accommodate storage of both foundational, stock or wild-collected seed for use in establishing seed production fields as well as storage for use on restoration, reclamation and rehabilitation projects.

Action 2.3.3: Recommend standards for seed cleaning and storage.
Create fact sheets outlining best practices for seed cleaning, germination tests, and storage conditions for priority species as the information becomes available from ongoing research on priority species.

Objective 2.4: Identify knowledge/capacity gaps in seed production.
This objective focuses on assessing gaps in seed production capacity and knowledge that prevent Wyoming from meeting current and future demand for seeds. As part of this objective, we will conduct interviews with producers and research options to mitigate their risk in growing priority species.

Action 2.4.1: Determine current status and location of producers and their capacity in Wyoming.
Determine whether there is a need for new producers in the state, such as producers in specific areas of the state, where no current producers exist or more producers to meet the demand for particular species.

Action 2.4.2: Conduct interviews with producers to understand their needs/challenges.
Perform a gap analysis by talking to producers to understand what information would be most beneficial to them to begin producing new species.

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Action 2.4.3: Assess the barriers for commercial production of priority species.
Use the information gathered from producers in Action 2.4.2 to determine what barriers present the biggest challenge to seed production and how those barriers could be addressed.

Action 2.4.4: Conduct research to address production challenges.
Test options for alleviating production challenges such as low plant establishment, pest management or pollinator limitations. All research under this Action will be prioritized and coordinated by the Research Committee.

Action 2.4.5: Explore opportunities to mitigate risk for producers.
Research and compile mechanisms that states, agencies and industry have used to mitigate risk to producers when growing novel, native species for seed production. Determine whether any of these mechanisms are feasible in Wyoming and make recommendations.

Objective 2.5: Share seed production knowledge.
This objective utilizes partnerships, connections, databases, fact sheets, presentations, and all available means to communicate knowledge gained from seed production research to stakeholders and producers.

Action 2.5.1: Create species production database.
Create a database with information on what species have been tried by seed producers, including which species have failed in production and reasons for that failure, if known. This database will also include information about commercial availability.

Action 2.5.2: Host seed producer forums and/or organize field tours.
Bring together producers to demonstrate how to grow priority species and to field any questions or concerns they have.

Action 2.5.3: Create fact sheets on production of priority species.
Work with existing organizations to develop fact sheets for producers on priority species that are not commercially available—including germination and establishment studies (e.g., Great Basin Forb Manual).

GOAL 3: Improve the use of genetically suitable seeds.

While successful restoration, reclamation and rehabilitation depend on the appropriate use of locally adapted, native seed, doing so is expensive and often limited. To achieve this goal, we need to understand the challenges around using native seeds at scale, conduct research to address gaps in knowledge to improve seeding success, establish best practices for seeding priority species (Objective 3.1) and provide forums for shared learning (Object 3.2). All research under this objective will be prioritized and coordinated by the Research Committee.

Objective 3.1: Determine and share best practices for seeding.

To achieve this objective, we will work to understand and address challenges with seeding priority species. We will also create opportunities to share best practices among the restoration community.

Action 3.1.1: Conduct interviews with seed users to understand their needs and challenges around use of priority species in revegetation projects.
Perform a gap analysis by talking to seed users to understand what information would be most beneficial to them to implement successful seeding.

Action 3.1.2: Host opportunities to share knowledge among seed users.
Success of a seed strategy for Wyoming is dependent on communication between groups, information transfer and research to address unknowns for reclamation practices, seed growth and cleaning. To facilitate this action, opportunities to share knowledge will occur through field tours, workshops, webinars, seed-based restoration forums and tutorials on seeding equipment.

Action 3.1.3: Conduct research/monitoring to inform best seeding practices for priority species.
Research on best seeding practices for priority species will be ongoing and will address unknowns such as seeding depth and seed pre-treatments. All research will be prioritized and coordinated by the Research Committee.

Action 3.1.4: Develop or provide references on seeding best practices for practitioners on priority species.
Based on Action 3.1.3, develop fact sheets on best seeding practices of priority species. In addition, create a repository that is easily accessible to practitioners where both fact sheets developed by the Wyoming Seed Working Group and existing resources are compiled by species.

Objective 3.2: Use demonstration sites to show challenges and successes for priority species.

This objective focuses on working with land managers and industry to create demonstration sites that use best seeding practices for priority species.

Action 3.2.1: Organize and lead field tours for reclamation practitioners and seed users.
Use demonstration sites to showcase the results of seeding priority species at restoration, reclamation or rehabilitation sites.

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GOAL 4: Pursue funding and external communication opportunities.

The objectives in this goal collectively address the financial and communication needs that must be met in order to successfully implement the Wyoming Seed Strategy. Specifically, we will work collaboratively across agencies and organizations in the state to estimate the budget needed for Strategy implementation, identify potential funding sources, and apply for funding to support the work, with emphasis on priority actions (Objective 4.1). This is crucial for supporting new infrastructure and capacity within the working group. In addition, we will aim to enhance external communications through presentations, events, social media and other digital outreach (Objective 4.2).

Objective 4.1: Pursue funding opportunities.

Many of the actions outlined in this Strategy will require funding to support new infrastructure or capacity for members of the Wyoming Seed Working Group. Outlining funding opportunities and determining which organizations are best poised to apply for those dollars will be important for implementing this Strategy.

Action 4.1.1: Estimate budget need for implementation of the Strategy.

Determining an overall cost to implementing this Strategy will aid the Wyoming Seed Working Group in seeking funding and will help prioritize actions.

Action 4.1.2: Identify potential funding sources for implementation of the Strategy and apply for funding.

The stakeholders of the Wyoming Seed Working Group will coordinate to identify funding sources. They will also

determine what organization(s) is best suited to apply for the funds on behalf of the Wyoming Seed Working Group and prioritize what Actions will be funded.

Objective 4.2: Cultivate support for the Strategy through external communication.

The success of the Wyoming Seed Strategy will depend on support from State and Federal agencies as well as partners outside of the Wyoming Seed Working Group. External communications will emphasize the importance of this work to those audiences.

Action 4.2.1: Distribute and/or present on the Wyoming Seed Strategy at outreach opportunities.

Members of the working group or their associated organizations will share the Strategy with individuals and organizations that have an interest or expertise in expanding the availability and use of native seed. The importance of this Strategy and the significant role of collaboration in meeting the Strategy's goals should be shared with a broad audience and incorporated into partner communications and materials, as appropriate.

Channels for marketing of these materials may include social media, email listservs, regional publications, meetings and other forums.

Action 4.2.2: Create video highlighting the Wyoming Seed Strategy and work being done under it.

Create a video that stakeholders can use to share information about the Strategy. This will be used to promote awareness and support with external audiences for the work being done under the Strategy.

Glossary

Common garden—An experiment where different genotypes, populations or varieties are grown together in the same environment such that environmental effects on trait expression are minimized and genetic differences are more readily observed.

Ecoregion—Areas of general similarity in ecosystems and in the type, quality and quantity of environmental resources. They are designed to serve as a spatial framework for the research, assessment, management and monitoring of ecosystems and ecosystem components.

Ecosystem—The biota (plants, animals, microorganisms) within a given area, the environment that sustains it, and their interactions.

Genetically suitable—Native plant materials adapted to a restoration site that are likely to establish, persist and promote community and ecological relationships. Such plants are: sufficiently diverse to respond and adapt to changing climates and environmental conditions; unlikely to cause genetic contamination and undermine local adaptations, community interactions and function of resident native species within the ecosystem; not likely to become invasive and displace other native species; not likely to be a source of non-native invasive pathogens; and likely to maintain critical connections with pollinators.

Habitat—The dwelling place of an organism or community that provides the requisite conditions for its life processes.

Local seed sourcing—Collecting seeds from an area geographically near a planting site that are environmentally adapted and likely to establish and persist.

Native species—Indigenous terrestrial and aquatic species that have evolved and occur naturally in a particular region, ecosystem, or habitat. Species native to North America are generally recognized as those occurring on the continent prior to European settlement. Native plant species represent a number of different life forms, including conifer trees, hardwood trees and shrubs, grasses, forbs and others.

Non-native species—An organism that has been introduced by humans to a location outside its native or natural range, also called alien, foreign, non-indigenous, or exotic. This designation can apply to a species introduced from another continent, another ecosystem, another seed zone, and even another habitat within an ecosystem. With respect to a particular ecosystem, this includes any species, including its seeds, eggs, spores or other biological material, capable of propagating that species, that is not native to that ecosystem. This definition of non-native will vary depending on the scope and context of projects.

Priority species—A plant species that the Wyoming Seed Working Group has determined is of importance to Wyoming and will be prioritized for collection, research and production.

Producers—Individual or companies that produce seed for restoration, reclamation or rehabilitation.

Reclamation—Actions to stabilize the terrain, assure public safety, improve aesthetics, and usually to return the land to what, within the regional context, is considered to be a useful purpose. Reclamation projects that are more ecologically based can qualify as rehabilitation or even restoration.

Rehabilitation—The recovery of ecosystem processes to regain normal function and ecosystem services without necessarily restoring the biodiversity of the reference site.

Research Committee—A group of researchers and land managers who will develop, prioritize and coordinate all research efforts within the Wyoming Seed Strategy. This committee will maintain a list of current research projects and new project priorities. It will identify funding opportunities for research priorities as well as researchers and graduate students involved in the research projects. This committee will ensure better cohesion and collaboration among researchers, reduce duplication and increase knowledge sharing.

Resilience—The degree to which an ecosystem is able to regain structural and functional attributes after it has suffered harm from stress or disturbance.

Restoration—The process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed.

Seed bank—Seed or propagule populations in the soil.

Seed zone—A mapped area with fixed boundaries in which seeds or plant materials can be transferred with minimal risk of maladaptation.

Sustainable seed collection—Defined by the seed collection permitting entity's requirements and guidelines.

Workhorse species—Species that are abundant across a wide range of ecological settings, establish quickly and produce high ground cover on disturbed sites.

Wyoming Seed Working Group—A working group of interested experts that was established to craft a Wyoming Seed Strategy and to enact its mission.

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